

***Testimony of Dr. Tom McCoy***  
***Science, Technology and Space Subcommittee***  
***Senate Committee on Commerce, Science and Transportation***  
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I am Tom McCoy, Vice President for Research, Creative Activities and Technology Transfer at Montana State University (MSU) in Bozeman, Montana. I am also Vice Chair of the EPSCoR Coalition, an organization of some 21 states and Puerto Rico that participate in the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR) and that have traditionally been viewed as "less research intensive states" – a term that is perhaps increasingly inappropriate, although these states collectively still receive less than 10 percent of all NSF funding and all federal R&D funding.

Montana State University serves a student body of approximately 11,000 students, most of whom come from Montana. It is the land grant institution in the state, and as such has strong and proven programs in agriculture and natural resources. I came to Montana State in 1990 and became Vice President for Research in 1998, after serving as a department head from 1990 to 1993 and Dean of the College of Agriculture from 1993 to 1998. During the past decade, we have made a number of changes at Montana State University; changes that I believe serve our students, our state and our nation well.

We continue to pursue a strong base of programs in agriculture and natural resources at Montana State. Several years ago, we were able to add a plant biosciences facility, partially funded by USDA, through a program that, unfortunately, no longer exists. We have moved into promising new areas in animal infectious diseases and biotechnology. Federal R&D funding has been significant but far from sufficient to meet the needs for research and infrastructure as agriculture and natural resources, like other areas, have become increasingly sophisticated.

During the last decade, Montana State University has experienced exponential growth in research areas. Since 1990, our external grants and contracts have increased about 400% -- from \$17 million in 1990 to about \$70 million this year. MSU was awarded one of the early NSF Engineering Research Centers (ERCs) and in a field, biofilms, that was, at the time, an emerging, relatively unsupported field. Our ERC has served as the model for biofilms programs in both the environmental and health fields and remains widely recognized. We have also developed a strong program in optoelectronics, in which our faculty is engaged in cutting edge research and which also provides laboratory facilities and support for many of the optoelectronic companies that have been created in the Bozeman area. This interaction with local business and industry has been beneficial to the university and the community. We have established one of the early programs in thermal biology, building both on the expertise of our faculty and our location near the thermal pools and soils in Yellowstone National Park. We have recruited a world-class cluster in neuroscience that is highly competitive for research funding.

We are developing a major new program focused on fuel cell technology. We have the only Master's degree program in the nation in science and natural history film-making.

Our research efforts are diversified, but focused. And, they are good. Our researchers are widely published and are winning competitive research awards. Our students are also successful. MSU ranks among the top schools in the country for the number of students who have received the nationally prestigious Goldwater Scholarships for undergraduate excellence in mathematics and science. This year's recipients are Zeb Barber of Belgrade, a junior studying laser optics; Sara E. Maccagnano, of Churchill, a 30-year old senior studying solid physics; and Britany Moss, 18, of Bozeman, a junior in biochemistry. The 2002 awards bring to 40 the number of MSU students who have won the scholarships. This places MSU sixth among the top ten institutions across the nation in the number of students receiving Goldwater Scholarships. In order, the top ten universities are: Harvard/Ratcliffe, Princeton, Duke, Kansas State, California Institute of Technology, Montana State, University of Chicago, Penn State, University of Illinois at Champaign/Urbana, Johns Hopkins and Washington University in St. Louis.

Most of our students attribute their success to participating in research projects. Cutting edge research opportunities are available to students at all levels through the Undergraduate Scholars Program, funded through EPSCoR, and other programs on campus.

In addition, two Montana State University seniors, Phenocia Bauerle and Kay Kirkpatrick, were named to the 13<sup>th</sup> annual All-USA College Academic Teams this year, bringing to 17 the number of MSU students selected since the program began in 1989. An MSU undergraduate won the Alice T. Schafer Prize for the nation's best female mathematics student. Three students who previously received Goldwater Scholarships while at MSU won 2002 Graduate Research Fellowships from the National Science Foundation.

I believe these figures indicate that Montana State University has an excellent track record in integrating research and teaching and helping to prepare the mathematicians, scientists and engineers of tomorrow. In addition to awards for individual students, our faculty have been granted two highly visible competitive awards -- a Center for Learning and Teaching (CLT) and an Integrative Graduate Education and Research Traineeship Program (IGERT) award by the NSF. Furthermore, we have operated a student research experiences program, using EPSCoR funds, that has supported more than 300 students. At Montana State University, we are developing a new core curriculum and a major focus of the new program is to integrate discovery and learning. We have initiated a highly focused program of freshman seminars and sophomore research experiences courses. Our goal is to eventually have every incoming student engaged in a freshman seminar and the sophomore research core.

I give this background for several reasons. One is to illustrate the quality of research that is being undertaken in the EPSCoR states. Another is to demonstrate the contributions that our universities are making not only in education and research but also to the community and state.

I am very proud of our achievements at Montana State University . I believe they are the outgrowth of several factors: the most important one is undoubtedly the ability to attract and retain good faculty who can win competitive awards. Another is the support that we have received from elected officials both on the federal and state level. A third is the commitment of two of our MSU presidents and our administration to identifying research areas where we have strength and finding the resources to pursue those areas. A fourth is the ability of a university such as MSU to integrate learning and discovery on our campus. And, fifth, but not least, is the support that we have received from NSF, the Congress and this committee for the EPSCoR program and related efforts, such as computing and networking.

Despite our success, I am acutely aware that we will continue to need substantial federal research funding, in particular EPSCoR funding and computing and networking support from the National Science Foundation, and infusion into the larger research community if we are to advance our research agenda. EPSCoR was created in the National Science Foundation and in its early years allowed states like Montana to encourage and support a limited number of principal investigators and to begin small research projects. Perhaps more importantly, however, it awakened us to the importance of R&D – both for our institutions and states – and helped us become aware of opportunities and possibilities that we might not otherwise have pursued. It has helped us focus the university’s goals of becoming more competitive nationally, thereby contributing to the nation’s knowledge base and to economic growth in the states.

A major obstacle for many “less research intensive” states and institutions has always been the lack of infrastructure. By this I mean we do not have adequate equipment or the special faculty hire or the faculty support package that would enable us to develop research expertise in a select area. EPSCoR is helping us develop that infrastructure.

NSF recently implemented a new EPSCoR infrastructure program. Montana was one of the first six recipients of funding under that new program. And, I can tell you that program is what we need at this particular time. It will, for the first time in the EPSCoR program’s history, give us a credible investment over a period of time that will allow us to develop the clusters and centers that are necessary if we are to be truly competitive. Most EPSCoR states have yet to receive funds under this program. None have been through a complete three-year cycle. **My most important request of you is to fully fund this program and let it fully operate over the next few years.** Capacity building takes time, as NSF and other agency efforts to create centers at major universities in the 1960’s indicates. This new EPSCoR infrastructure program is a good one. Let it work! This infrastructure program, together with similar efforts at NIH, are the base for future competitive research activities in almost half of the states in this nation.

I would also like to make a plea for continued support for advanced computing and networking in our states. Several years ago, when NSF started its new networking program, it appeared as if the EPSCoR states would be left out. In fact, of the first 57 awards made under the vBNS high-speed connections program, only one went to an EPSCoR state. Thanks to efforts within NSF – and strong support from this committee – the program was expanded,

supplements were provided and ultimately, there was at least one connection in every state. About the same time, the President's Information Technology Advisory Committee (PITAC) was formed – initially without a single member from an EPSCoR state. Again, thanks to this committee, especially to Senator Burns, Senator Lott, Senator Hollings and Senator Rockefeller, and to support at NSF, we were able to have two appointments made from EPSCoR states.

I single out advanced computing and networking for several reasons. First, they are of particular importance to the EPSCoR states. Most of the EPSCoR states are either rural and sparsely populated or serve large numbers of under-represented groups, two categories where connections and advanced computing capabilities tend to be most lacking. Secondly, our rural areas are where these services tend to be the most expensive. The digital divide is largely about money. Thirdly, advanced computing and networking are so important because they are the principal means by which people in rural states can overcome the limits of geography. With advanced computing and networking capabilities, we can enhance the educational offerings for our students, have our faculty collaborate with scientists at distant points, access and use equipment at remote sites and manipulate and analyze large data sets located elsewhere. All of this means more advanced research capabilities on our campuses.

Advanced computing and networking are infrastructure, especially in the rural and EPSCoR states. They are our lifeline to the larger research community, to research competitiveness and to recognized research expertise for our institutions. For that reason, I believe that advanced computing and networking are areas where there must be special efforts to insure that all states participate fully in federal programs.

Facilities continue to be a major challenge for institutions such as Montana State. We do not have the resources and endowments that many institutions have. The opportunity for raising large sums from private sources is limited. Yet, increasingly, our researchers need state-of-the-art laboratories and facilities if we are to pursue the latest research opportunities. And if we are to make the most of major increases in NIH and NSF funding, additional facilities are vital. At this very moment, MSU has access to major equipment valued at \$850,000, which would be a major asset for our nanotechnology group, but we cannot take possession because we do not have a proper facility for it.

A strong instrumentation program at NSF is also essential. Ultimately, research success depends upon researchers. And, it is difficult to attract and retain good researchers if you cannot provide them with the tools necessary to undertake their research. Start-up costs for new hires in the sciences continue to rise. We are fortunate that new technologies and new equipment allow us to dramatically expand our horizons, but that comes at a cost and if a university cannot meet those costs, then its research activities will falter.

Finally, I would like to comment on participation or inclusion. For many years,

researchers from EPSCoR states were seldom found on review panels or advisory committees. Some efforts have been underway at NSF to rectify this lack of representation and, in some programs, we have seen real progress. In others, we still have a way to go. Serving on such panels is vital to integrating our researchers into the over-all research community, as is the technical assistance provided by NSF through the Centers Development Initiative (CDI). I mentioned the earlier experience with PITAC, where this committee helped secure representation for EPSCoR states. We currently have no one from an EPSCoR state on the PCAST and only two members from EPSCoR states on the National Science Board. This is important. Please do not forget us.

In a recent discussion, someone asked me what the EPSCoR states really want. There is no one answer. But, I have tried to suggest several. We want a truly national – and international – research community. We believe that almost half of the states in this country should be sharing a bit more than 10 percent of all federal R&D. We want a vibrant and widely dispersed networking and advanced computing infrastructure. We need help with facilities and equipment. We need a strong and fully funded EPSCoR program, and for that we need your continued support.

Legislation has been introduced in the House of Representatives to move toward a doubling of the NSF budget. The Coalition of EPSCoR States supports that legislation. I believe, however, that any doubling should have focus. There must be priorities and a roadmap for where we are going – and EPSCoR should be part of that roadmap to assist the 21 states and Puerto Rico that participate in the program. We also support legislation to expand networking and advanced computing programs at NSF, again making a special effort to see that this infrastructure is widely dispersed.

We appreciate the work of this Committee and look forward to working with you. Thanks for giving me the opportunity to testify.